IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF APPEALS

In re Patent Application of: **SMITH ET AL**	
Serial No. **10/760,996**	Atty. Docket No.: **72212**
Filing Date: **JANUARY 20, 2004**	Art Unit: **2646**
Confirmation No. **1657**	
For: **TECHNIQUE FOR INDEPENDENT GROUND FAULT DETECTION OF MULTIPLE TWISTED PAIR TELEPHONE LINES CONNECTED TO A COMMON ELECTRICAL POWER SOURCE**	Examiner: **WALTER F. BRINEY, III**

APPELLANTS' APPEAL BRIEF UNDER 37 C.F.R. § 41.37

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Sir:

This is an Appeal from the Final Rejection dated April 18, 2006, of claims 15-18, 21-24 and 27-29, in the above-identified application. Please charge the requisite $500 large entity fee for filing the brief to the credit card noted in the attached credit card payment form PTO-2038. If any additional extension and/or fee is required, authorization is given to charge Deposit Account No. **01-0484**.

37 C.F.R. § 41.37 (c)(1)(i) *Real Party in Interest*

The real party in interest in the present Appeal is Adtran, Inc., 901 Explorer Boulevard, Huntsville, Alabama 35806, the assignee of the present application, as recorded in the US Patent and Trademark Office on January 20, 2004, having reel number 014911 and frame number 0262.

37 C.F.R. § 41.37 (c)(1)(ii) *Related Appeals and Interferences*

At present there are no related Appeals or interferences.

37 C.F.R. § 41.37 (c)(1)(iii) *Status of Claims*

Twenty-nine claims have been filed in the present application. Of these twenty-nine claims, claims 1-14, 19, 20, 25 and 26 have been cancelled. All of the remaining claims (15-18, 21-24 and 27-29) stand rejected. The claims on appeal are rejected claims 15-18, 21-24 and 27-29.

A copy of claims 15-18, 21-24 and 27-29 involved in this Appeal is set forth below in the claims Appendix.

37 C.F.R. § 41.37 (c)(1)(iv) *Status of Amendments*

All amendments have been entered in the present application. No amendments were filed in response to the final rejection of April 18, 2006.

37 C.F.R. § 41.37 (c)(1)(v) *Summary of Claimed Subject Matter*

Of the eleven claims (15-18, 21-24 and 27-29) involved in the present Appeal, claims 15, 21 and 27 are independent. Independent claims 15 and 21 define the invention in terms of a method, while independent claim 27 defines the invention in terms of a system.

The subject matter of these claims relates to a methodology and system for supplying electrical power to a plurality of remote pieces of telecommunication equipment by way

of respective telecommunication wireline segments that derive their power from a common or shared power source installed at a facility such as a central office, in a manner that prevents the occurrence of a ground fault on any one of the wireline segments from causing misoperation of, or effectively 'bringing down', all of the other wireline segments of the system. As will be described below, and as is particularly delineated in the claims on appeal, this is accomplished by installing, within each wireline segment, a respective ground fault detection and isolation circuit that is operative, in response to detecting the occurrence of a ground fault in its associated segment, to decouple and isolate that wireline segment from the remainder of the system, so that the effects of the ground fault may be confined to only the ground-faulted wireline segment, and therefore do not impair the continued operation of equipment connected to the other wireline segments.

In order to facilitate an understanding of this inventive methodology and system, it is instructive to review the state of the art as it existed prior to Appellants' invention. The general architecture of a conventional span-powered telecommunication system is represented by reduced complexity diagram of Figure 1, which constitutes the admitted prior art. As shown therein, this system comprises a first transceiver unit 10, installed at a central office site that terminates an upstream end 21 of a single twisted pair (or span) 20 of telephone wires, and a second transceiver unit 30, installed at a remote terminal equipment site that terminates a downstream end 22 of the span 20. In order to deliver electrical power (in addition to its telecommunication signal-conveying function) to the equipment installed at the remote site, the upstream end of the span 20 is coupled to an electrical power source, which is typically installed in the central office. As a result of this (central office) connection of

the span 20 to an electrical power source, requiring the remote site to rely on the availability of local power (which can go down in the event of a local anomaly, such as a storm) is obviated.

In addition to coupling an upstream power source to the central office end of a single wireline segment for span-powering a single piece of remote telecommunication equipment as depicted in the prior art architecture of Figure 1, it is often desirable to use that same power source to power multiple pieces of remote equipment. In such an application, multiple central office transceivers may be connected to a single (central office site-based) power source, so that they may derive span power for their associated remote equipments from this common or shared power unit.

While implementing such a common power source-based multiple equipment architecture might appear to be relatively straightforward, Appellants have described that this is not the case. In particular, Appellants (not the admitted prior art) have described that when multiple wireline segments are used to deliver span power derived from a common power source to respective ones of remote pieces of telecommunication equipment, there is the potential problem of multiple or total transceiver failure should a ground fault occur on any one of the wireline segments. Such a ground fault may be caused by an insulation failure - resulting in an electrical current path to earth (i.e., ground fault), and represents a hazardous voltage condition to service personnel. Appellants (again, not the admitted prior art) have further described that, because all of the wireline segments or spans are powered from a common power source, an interruption of normal power source operation caused by the occurrence of a ground fault on any one span will effectively ripple among and adversely impact the operation of all pieces of transceiver equipment on all the

wireline segments powered by that source.

Thus, as Appellants (not the admitted prior art) have explained, successfully implementing a practical, multiple span-powered equipment architecture is not simply a matter of connecting all of the wireline segments to a common or shared power source. Rather, as detailed by Appellants in the present application, and as will be discussed below, successful implementation of a multiple span-powered equipment architecture, in accordance with the invention defined in the claims on appeal, involves installing, within each of the wireline segments that receive their power from a common or shared power source, a respective ground fault detection and isolation circuit. This circuit is operative, in response to detecting the occurrence of a ground fault in its associated segment, to decouple and isolate that wireline segment from the remainder of the system. By doing so, the effects of the ground fault will be effectively confined to only the now isolated wireline segment, and therefore will not impair the continued operation of the telecommunication equipment that is connected to and span-powered by the other wireline segments.

The general architecture of such a span-powered multi-telecommunication wireline segment-configured system is shown diagrammatically in Figure 3 and described in paragraphs [05]-[14] on pages 3-7 of the specification. As shown and described therein, power from an electrical power source 220 is delivered by way of each of a plurality of span-powered busses or wireline segments 210 for delivery to respective ones of a plurality of downstream functional remote terminals (RTs) 230-1 . . . 230-N. Installed within each of these wireline segments are respective digital subscriber line-central office terminals (DSL-Cs) 200-1 . . . 200-N. These terminals conduct DLS communications over and

receive their electrical power by way of a span-powered communication bus 210 from the common electrical power source 220.

In accordance with the present invention, within each DSL-C 200, span power from the source 220 is processed by a respective ground fault detection circuit 201 prior to being delivered to its associated downstream remote terminal (RT) 230. In particular, the ground fault detection circuit 201 senses currents I1 and I2 within respective sense resistors R1sense and R2sense shown in the circuit diagram of Figure 4. A difference between voltages representative of these two currents produces an output indicating that a ground fault current is flowing. This identification of the occurrence of a ground fault initiates the disconnection and isolation of the particular faulted wireline segment in which the ground fault detection circuit 201 is installed, from the remainder of the system. This isolation of the ground-faulted wireline segment from the remainder of the system allows the remaining multiple span-powered twisted pair telephone lines 210 and their associated remote terminals 230 to continue normal operation. Namely, the detection an isolation mechanism of the invention prevents the occurrence of a ground fault on one span-powered wireline segment from bringing down the whole system.

Key distinctions between the subject matter of the claims on appeal and the prior art upon which the Final Rejection is based include the fact that the invention installs, in respective ones of the wireline segments 210, respective ones of a plurality of ground fault detection and isolation circuits 201, each of which monitors its associated wireline segment for the occurrence of a ground fault therein. Secondly, should any of these ground fault detection and isolation circuits 201 detect

the occurrence of a ground fault, that circuit will decouple and isolate its associated telecommunication wireline segment from the span-powered bus. This prevents a reduction in the span power being delivered by the remainder of the telecommunication wireline segments in which no ground fault has occurred, and thereby prevents misoperation of the remote telecommunication terminals that are coupled to these telecommunication wireline segments. As will be discussed below, neither of these features is disclosed or suggested by the prior art relied upon to reject the claims on appeal.

The following is a correlation of the subject matter of independent claims 15, 21 and 27, by parenthetical reference (in bold), to the drawings and associated description in the specification.

Claim 15

15. A method of delivering span power **(specification: paragraph [01], line 3; paragraph [05], lines 3, 4; Figure 3 - electrical power source 220, span power bus 210)** by way of a plurality of telecommunication wireline segments **(specification: paragraph [01], lines 6-9; paragraph [05], lines 3, 5; Figure 3 - span-powered wireline segments 210)** to respective ones of a plurality of remote telecommunication terminals **(specification: paragraph [05], lines 10 and 11; Figure 3 - remote terminals 230-1…230-N)**, said method comprising the steps of:

(a) coupling said plurality of telecommunication wireline segments to a span power bus **(specification: paragraph [08], lines 1-11; Figure 3 - electrical power source 220 coupled to span power bus segments 210)**, so that span power **(Figure 3 - electrical power source 220)** is coupled from said span power bus **(Figure 3 - span power bus 210)** to said plurality of telecommunication wireline segments **(Figure 3 - segments 210)**;

(b) coupling respective ones of said plurality of telecommunication wireline segments to respective ones of said plurality of remote telecommunication terminals **(Figure 3 - span power segments 210, coupled to remote terminals (RT) 230-1…230-N; specification: paragraph [08], lines 11-16)**, so that said span power is delivered by said plurality of telecommunication wireline segments to said respective ones of said plurality of remote telecommunication terminals;

(c) coupling respective ones of said plurality of telecommunication wireline segments to respective ones of a plurality of ground fault detection and isolation circuits **(Figure 3 - span power bus segments 210, coupled to respective DSL-Cs 200-1…200-N, each containing a respective ground fault detection circuit 201-i; specification: paragraph [08], lines 11-19)**, a respective ground fault being capable of causing electrical current in excess of normal load current to flow in a remote telecommunication terminal that is connected to the respective telecommunication wireline segment in which the ground fault has occurred **(specification: paragraph [06], lines 1-5)**, and causing a reduction in said span power to a level that prevents proper operation of a remote telecommunication terminal that is coupled to a telecommunication wireline segment in which no ground fault has occurred **(specification: paragraph [06], lines 5-10)**;

(d) causing said ground fault detection and isolation circuits to monitor said plurality of telecommunication wireline segments for the occurrence of a ground fault therein **(specification: paragraph [06], lines 10-17; paragraph [08], lines 11-19)**; and

(e) in response to a ground fault detection and isolation circuit detecting, in step (d), the occurrence of a ground fault in an associated telecommunication wireline segment to which said ground fault detection and isolation circuit is coupled, causing

said ground fault detection and isolation circuit to decouple and isolate said associated telecommunication wireline segment from said span power bus **(specification: paragraph [06], lines 10-17; paragraph [14], lines 8-18)**, so as to prevent said reduction in said span power being delivered by others of said plurality of telecommunication wireline segments, in which no ground fault has been detected as having occurred, to remote telecommunication terminals coupled thereto **(specification: paragraph [04], lines 3-9)**, thereby preventing misoperation of said remote telecommunication terminals coupled to said others of said plurality of telecommunication wireline segments **(specification: paragraph [04], lines 6-9)**, wherein

step (d) comprises the steps of:

(d1) at said ground fault detection and isolation circuit, measuring a first parameter **(specification: paragraph [12], line 9 - voltage V01)** representative of current **(specification: paragraph [12], line 9 - current I1)** flowing in a first segment portion **(specification: paragraph [12], line 9 - sense resistor R1sense; Figure 4 - resistor R1sense)** of said associated telecommunication wireline segment to said remote telecommunication terminal, and measuring a second parameter **(specification: paragraph [13], lines 1, 2 - voltage V02)** representative of current **(specification: paragraph [13], line 3 - current I2)** flowing in a second segment portion **(specification paragraph [13], lines 3, 4 - sense resistor R2sense)** of said associated telecommunication wireline segment from said remote telecommunication terminal, and

(d2) at said ground fault detection and isolation circuit, in response a difference **(specification: paragraph [14], lines 5-8)** in said first and second parameters, providing an output representative of the occurrence of a ground fault in said associated telecommunication wireline segment, and wherein

step (e) comprises causing said ground fault detection and

isolation circuit to decouple, and thereby isolate, said associated telecommunication wireline segment from said span power bus **(specification: paragraph [14], lines 11-18)**, in response to step (d1) providing said output representative of the occurrence of a ground fault in said associated telecommunication wireline segment **(specification: paragraph [37], lines 5-12).**

Claim 21

21. A method of delivering power, applied from an electrical power source to a span power bus **(specification: paragraph [01], line 3; paragraph [05], lines 3, 4; Figure 3 - electrical power source 220, span power bus 210)**, by way of a plurality of telecommunication wireline segments **(specification: paragraph [01], lines 6-9; paragraph [05], lines 3, 5; Figure 3 - span-powered wireline segments 210)** to respective ones of a plurality of remote telecommunication terminals **(specification: paragraph [05], lines 10 and 11; Figure 3 - remote terminals 230-1…230-N)**, said method comprising the steps of:

(a) coupling first portions **(upstream ends of wireline segments 210, Figure 3)** of said plurality of telecommunication wireline segments to said span power bus **(specification: paragraph [08], lines 1-11; Figure 3 - electrical power source 220 coupled to span power bus segments 210)**, so that power **(Figure 3 -electrical power source 220)** is coupled from said span power bus **(Figure 3 - span power bus 210)** to said first portions of said plurality of telecommunication wireline segments **(Figure 3 - segments 210)**;

(b) coupling second portions **(downstream ends of wireline segments 210, Figure 3)** of said plurality of telecommunication wireline segments to said respective ones of said plurality of remote telecommunication terminals **(Figure 3 - span power segments 210, coupled to remote terminals (RT) 230-1…230-N; specification: paragraph [08], lines 11-16)**, so that

power coupled from said span power bus to said first portions of said plurality of telecommunication wireline segments is delivered by said second portions of said plurality of telecommunication wireline segments to said respective ones of said plurality of remote telecommunication terminals;

(c) coupling the first and second portions of respective ones of said plurality of telecommunication wireline segments to respective ones of a plurality of ground fault detection and isolation circuits **(Figure 3 - span power bus segments 210, coupled to respective DSL-Cs 200-1…200-N, each containing a respective ground fault detection circuit 201-i; specification: paragraph [08], lines 11-19)**;

(d) causing each ground fault detection and isolation circuit to monitor the respective telecommunication wireline segment to which said each ground fault detection and isolation circuit is coupled for the occurrence of a ground fault **(specification: paragraph [06], lines 10-17; paragraph [08], lines 11-19)**; and

(e) in response to a respective ground fault detection and isolation circuit detecting the occurrence of a ground fault on said respective telecommunication wireline segment in step (d), causing said respective ground fault detection and isolation circuit to perform the operation of decoupling, and thereby isolating, said respective telecommunication wireline segment from said span power bus **(specification: paragraph [06], lines 10-17; paragraph [14], lines 8-18)**, said operation being effective to prevent a change in the power being delivered by others of said plurality of telecommunication wireline segments to remote telecommunication terminals coupled thereto **(specification: paragraph [04], lines 3-9)**, and thereby prevent misoperation of said remote telecommunication terminals coupled to said others of said plurality of telecommunication wireline segments **(specification: paragraph [04], lines 6-9)**, wherein

step (d) comprises the steps of:

(d1) at said each ground fault detection and isolation circuit, measuring a first parameter **(specification: paragraph [12], line 9 - voltage V01)** representative of current **(specification: paragraph [12], line 9 - current I1)** flowing in a first segment portion of said respective telecommunication wireline segment **(specification: paragraph [12], line 9 - sense resistor R1sense; Figure 4 – resistor R1sense)** to said remote telecommunication terminal, and measuring a second parameter **(specification: paragraph [13], lines 1, 2 - voltage V02)** representative of current **(specification: paragraph [13], line 3 - current I2)** flowing in a second segment portion of said respective telecommunication wireline segment **(specification paragraph [13], lines 3, 4 - sense resistor R2sense)** from said remote telecommunication terminal, and

(d2) at said each ground fault detection and isolation circuit, in response **(specification: paragraph [14], lines 5-8)** a difference in said first and second parameters, providing an output representative of the occurrence of a ground fault in said respective telecommunication wireline segment, and wherein

step (e) comprises causing said respective ground fault detection and isolation circuit to decouple, and thereby isolate, said respective telecommunication wireline segment from said span power bus **(specification: paragraph [14], lines 11-18)**, in response to step (d1) providing said output representative of the occurrence of a ground fault in said respective telecommunication wireline segment **(specification: paragraph [37], lines 5-12)**.

Claim 27

27. A system for controlling delivery of span power supplied by a span power bus **(specification: paragraph [01], line 3; paragraph [05], lines 3, 4; Figure 3 - electrical power source 220, span power bus 210)** to respective ones of a plurality of

remote telecommunication terminals **(specification: paragraph [05], lines 10 and 11; Figure 3 - remote terminals 230-1…230-N)**, said system comprising:

a plurality of telecommunication wireline segments **(specification: paragraph [08], lines 1-11; Figure 3 - electrical power source 220 coupled to span power bus segments 210)** coupled to said span power bus, so that span power **(Figure 3 -electrical power source 220)** is coupled from said span power bus **(Figure 3 - span power bus 210)** to said plurality of telecommunication wireline segments **(Figure 3 - segments 210)**, respective ones of said plurality of telecommunication wireline segments being coupled to respective ones of said plurality of remote telecommunication terminals **(specification: paragraph [05], lines 10 and 11; Figure 3 - remote terminals 230-1…230-N)**, so that said span power is delivered by said plurality of telecommunication wireline segments **(specification: paragraph [01], lines 6-9; paragraph [05], lines 3, 5; Figure 3 - span-powered wireline segments 210)** to said respective ones of said plurality of remote telecommunication terminals **(specification: paragraph [05], lines 10 and 11; Figure 3 - remote terminals 230-1…230-N)**; and

a plurality of ground fault detection and isolation circuits, coupled with respective ones of said plurality of telecommunication wireline segments between said span power bus and said plurality of remote telecommunication terminals **(Figure 3 - span power bus segments 210, coupled to respective DSL-Cs 200-1…200-N, each containing a respective ground fault detection circuit 201-i; specification: paragraph [08], lines 11-19)**, and being operative to monitor respective ones of said plurality of telecommunication wireline segments for the occurrence of a ground fault therein **(specification: paragraph [06], lines 10-17; paragraph [08], lines 11-19)**, a ground fault being capable of presenting a hazardous voltage condition to service personnel **(specification: paragraph [03], lines 12-16)**, causing electrical

current in excess of normal load current to flow in a remote telecommunication terminal that is connected to the respective telecommunication wireline segment in which the ground fault has occurred **(specification: paragraph [06], lines 1-5)**, as well as producing a reduction of normal span power supplied by said span power bus and said telecommunication wireline segments, causing remote telecommunication terminals to malfunction **(specification: paragraph [06], lines 5-10)**; and wherein

a respective ground fault detection and isolation circuit is operative, in response to detecting the occurrence of a ground fault in an associated telecommunication wireline segment to which said respective ground fault detection and isolation circuit is coupled, to decouple and isolate said associated telecommunication wireline segment from said span power bus **(specification: paragraph [06], lines 10-17; paragraph [14], lines 8-18)**, so as to prevent said reduction in said span power being delivered by others of said plurality of telecommunication wireline segments, in which no ground fault has been detected as having occurred, to remote telecommunication terminals coupled thereto **(specification: paragraph [04], lines 3-9)**, thereby preventing misoperation of said remote telecommunication terminals coupled to said others of said plurality of telecommunication wireline segments **(specification: paragraph [04], lines 6-9)**, wherein

said respective ground fault detection and isolation circuit is operative to detect the occurrence of a ground fault in said associated telecommunication wireline segment and to decouple and isolate said associated telecommunication wireline segment from said span power bus by:

i- measuring a first parameter **(specification: paragraph [12], line 9 - voltage V01)** representative of current **(specification: paragraph [12], line 9 - current I1)** flowing in a first segment portion **(specification: paragraph [12], line 9 -**

sense resistor R1sense; Figure 4 - resistor R1sense) of said associated telecommunication wireline segment to said remote telecommunication terminal,

ii- measuring a second parameter **(specification: paragraph [13], lines 1, 2 - voltage V02)** representative of current **(specification: paragraph [13], line 3 - current I2)** flowing in a second segment portion **(specification paragraph [13], lines 3, 4 - sense resistor R2sense)** of said associated telecommunication wireline segment from said remote telecommunication terminal, and

iii- in response to detecting a difference **(specification: paragraph [14], lines 5-8)** in said first and second parameters - indicating the occurrence of a ground fault - decoupling, and thereby isolating, said associated telecommunication wireline segment from said span power bus **(specification: paragraph [14], lines 11-18)**.

37 C.F.R. § 41.37 (c)(1)(vi) *Grounds of Rejection to be Reviewed On Appeal*

Claims 15-18, 21-24 and 27-29 stand rejected under 35 U.S.C. § 103 as being unpatentable over Figure 1 and paragraphs [02] and [03] of the present specification in view of the cited patent to Takeshita et al 4,385,336.

37 C.F.R. § 41.37 (c)(1)(vii) *Argument*

In order to facilitate the Board's appreciation of the differences between the invention, as set forth in the appealed claims, and the documentation upon which the Examiner relies, each of the respective documents will be initially reviewed.

Figure 1 of the drawings of the present application, which depicts the admitted prior art, is described in paragraph

[02] of the present specification. As pointed out above, such illustration and description relate to a prior art digital transmission system in which a single remote transceiver receives its power over twisted pair 20 from the central office unit 10.

In paragraph [03] of the specification, Appellants describe that, in such a span-powered configuration, it is often desirable for multiple central office transceiver units to derive span power for their respective remote transceiver units from a common or shared electrical power source.

Appellants (not any admitted prior art) then go on to explain that if such a common power source-based multiple equipment architecture were to be implemented, there is the potential problem of multiple or total transceiver failure, should a ground fault occur on any one of the wireline segments. Appellants (again, not the admitted prior art) further describe that, because all of the wireline segments or spans are powered from a common power source, an interruption of normal power source operation caused by the occurrence of a ground fault on any one span will effectively ripple among and adversely impact the operation of all pieces of transceiver equipment on all the wireline segments powered by that source.

Namely, it is only Appellants (not the admitted prior art) who have described that successfully implementing a practical, multiple span-powered equipment architecture is not simply a matter of connecting all of the wireline segments to a common or shared power source. Rather, successful implementation of a multiple span-powered equipment architecture requires the invention defined in the claims on appeal, and involves installing, within each of the wireline segments that receive their power from a common or shared power source, a respective

ground fault detection and isolation circuit.

As detailed above, this circuit is operative, in response to detecting the occurrence of a ground fault in its associated segment, to decouple and isolate that wireline segment from the remainder of the system. By doing so, the effects of the ground fault will be effectively confined to only the now isolated wireline segment, and therefore will not impair the continued operation of the telecommunication equipment that is connected to and span-powered by the other wireline segments.

Namely, the ground fault problem to which the present invention is directed has been described only by Appellant, not in the admitted prior art of Figure 1, or the desire to provide span power to multiple remote terminals. The effect of a ground fault on any of multiple span-powered segments and the need to isolate the segment upon which the ground fault has occurred, as well as a mechanism for accomplishing that isolation has been described only by Appellants, not in any valid statutory reference upon which the Examiner relies. As will be discussed below, the reference to Takeshita et al also fails to address either such problem or its solution as set forth in Appellants' claims.

More particularly, the patent to Takeshita et al 4,385,336 illustrates and describes a resistance control circuit to be incorporated within a speech current supplying circuit of a subscriber's telephone set. The purpose of this resistance control circuit is to selectively increase the ring-side and tip-side resistances of the current supplying circuit, in order to prevent the current-supplying circuit from breakdown, in the event of a ground fault (or shorted-to-ground accident, as described by the patentees). In addition to increasing these

resistances, a threshold that is used by a comparator to detect the ground fault is decreased, in order to prevent oscillation or ringing in the detection operation.

The patent to Takeshita et al does not address ground fault problems in a multiple span-powered telecommunication system, nor does it disclose or suggest decoupling and isolating that one of the span-powered wireline segments in which a ground fault has been detected to have occurred, as specifically delineated in the claims on appeal.

The deficiencies of the rejection of claims 15-18, 21-24 and 27-29 under 35 U.S.C. § 103 as being unpatentable over Applicants' admitted prior art in view of the patent to Takeshita et al

As noted above, there are three independent claims on appeal - claims 15, 21 and 27. Each of these claims is similar in scope, with claims 15 and 21 being directed to a "method", while claim 27 defines the combination of components that make up the recited "system". In an effort to avoid a repetition of arguments, and to consolidate the Appeal to a single claim, the following discussion will treat the deficiencies of the rejection of independent claim 21, upon which claims 23-24 depend. As such, the rejection of claims 22-24 dependent thereon, as well as the rejection of claims 15-18 and 27-29 may stand or fall with the reversal or sustaining of the rejection of claim 21. While claim 21 is not identical in scope with independent claims 15 and 27, it is considered to concisely define the invention using terminology similar to independent claims 15 and 27 and, as such, the sustaining or reversal thereof is presented by the Appellants to the Board as being dispositive of all the claims in the present Appeal.

In accordance with the preamble of claim 21, the invention is recited as being directed to a method of delivering power from an electrical power source applied to a span power bus, by way of a plurality of telecommunication wireline segments to respective ones of a plurality of remote telecommunication terminals. As such, first portions of such plurality of telecommunication wireline segments are coupled to the span power bus so that power therefrom will be coupled to those first portions of the plurality of wireline segments. This is what is recited in step (a) of claim 21.

In addition, as recited in step (b) of claim 21, second portions of such wireline segments are coupled to respective ones of a plurality of remote telecommunication terminals, so that power coupled from the span power bus will be delivered by those second portions of the telecommunication wireline segments to the remote telecommunication terminals.

Step (c) of claim 21, which the Examiner acknowledges is not anticipated by the Appellants' admitted prior art, recites the step of:

> "coupling the first and second portions of respective ones of said plurality of telecommunication wireline segments to respective ones of a plurality of ground fault detection and isolation circuits."

As set forth above in the correlation between the language of claim 21 and the specification and drawings of the present application, step (c) of claim 21 is accomplished by the ground fault detection and isolation circuits 201, that are installed within the respective DSL-C unit 200, of the respective wireline segments 210, over which span power from the electrical power source 220 is conveyed to the remote terminals 230.

In the paragraph bridging pages 2 and 3 of the Final Rejection, the Examiner incorrectly refers to paragraph [03] of the present application, which identifies the ground fault problem recited in step (c), as being admitted prior art.

This inaccuracy was pointed out above; the ground fault problem, to which the present invention is directed, <u>has been described only by Appellant</u>, not in the admitted prior art of Figure 1, or in Appellants' statement of a desire to provide span power to multiple remote terminals. The effect of a ground fault on any of the multiple span-powered segments and the need to isolate the segment upon which the ground fault has occurred, as well as mechanism for accomplishing that isolation, have <u>been described only by Appellants, not</u> in any valid statutory reference upon which the Examiner relies.

In addition to acknowledging that step (c) of claim 21 is not anticipated by its admitted prior art, the Examiner has acknowledged to the failure of the prior art to disclose or suggest steps (d) and (e) (of claim 15). The same applies to claim 21.

In particular, claim 21 specifies the step of:

> "(d) causing each ground fault detection and isolation circuit to monitor the respective telecommunication wireline segment to which said each ground fault detection and isolation circuit is coupled for the occurrence of a ground fault."

Since the admitted prior art incorporates no ground fault detection and isolation circuits of any kind, it certainly does not monitor the wireline segments, in which such circuits are <u>not installed</u>, for the occurrence of ground fault.

The last step (e) of claim 21 reads as follows:

> "in response to a respective ground fault detection and isolation circuit detecting the occurrence of a ground fault on said respective telecommunication wireline segment in step (d), causing said respective ground fault detection and isolation circuit to perform the operation of decoupling, and thereby isolating, said respective telecommunication wireline segment from said span power bus, said operation being effective to prevent a change in the power being delivered by others of said plurality of telecommunication wireline segments to remote telecommunication terminals coupled thereto, and thereby prevent misoperation of said remote telecommunication terminals coupled to said others of said plurality of telecommunication wireline segments."

As pointed out above, neither the single span-powered system of Figure 1 (prior art), nor the multiple segment span-powered system, described in the first portion of paragraph [03] of the present specification, addresses the problem of the misoperation of a multiple segment system that results from the occurrence of a ground fault in an individual one of the multiple segments, nor does the prior art propose installing respective ground fault detection and isolation circuits in each of the segments, and isolating the respective segment in which a ground fault has occurred, from the remainder of the system, as specifically delineated in accordance with the methodology set forth in appealed claim 21.

Recognizing this failure of both the single span and multiple span-powered systems described in Appellants' specification, the Examiner then alleges that the patent to Takeshita et al makes obvious the methodology of the claims on appeal. He initially states that Takeshita et al recognizes the ground fault problem "in the scope of" (whatever that means) a current supplying circuit for use in a subscriber circuit (i.e., the central office transceiver of Appellants' prior art). The

Examiner refers to columns 1 and 2 of the patent to Takeshita et al, specifically noting lines 6-12 of column 1 of the reference.

The Examiner's proposed identity of the current supplying circuit for a subscriber's handset in Takesita et al with the central office transceiver unit 10 of the prior art Figure 1 of the present application is not only inaccurate, but it does not address the claimed invention. The invention delineated in the appealed claims does not reside in the central office. Appealed claim 21 recites coupling respective ones of a plurality ground fault detection and isolation circuits to respective ones of a plurality of telecommunication wireline segments. The claims do not recite installing a ground fault detection circuit in the central office transceiver, particularly a single span-powered system of the type shown in Figure 1 (prior art).

Moreover, the ground fault-based control mechanism employed by the circuit of Takeshita et al is installed, not in a central office transceiver, as inaccurately proposed by the Examiner, but rather in a subscriber circuit, such as a telephone handset, as specifically described in column 3, lines 3-5 of the patent. This current supplying circuit is used to provide current to the speech circuit of the subscriber device, as further described in column 3, lines 5-8 of the patent to Takeshita et al. There is no disclosure or suggestion of using Takeshita et al's speech current supplying circuit in a central office transceiver, as inaccurately alleged by the Examiner.

Moreover, the shorted-to-ground fault detection function carried out within the subscriber circuit of Takeshita et al is for the purpose of <u>controlling the internal resistance</u> of the speech current supplying circuit of a telephone handset,

not for the purposes of isolating a span-powered telecommunication wireline segment over which span power is delivered from an electrical power source to respective ones of a plurality of remote terminals, as recited in claim 21.

Appellants also respectfully submit that the characterization of the functionality of Takeshita et al in the first full paragraph on page 3 of the Final Rejection is inaccurate. Specifically, the Examiner has alleged that, in operation, the invention of Takeshita et al detects a ground fault in a subscriber line "and reduces current thereto (i.e. 'isolates')."

The actual operation of the current supplying circuit of Takeshita et al is set forth in detail in column 3, line 24 through column 4, line 9 of the patent. In accordance with this description, Takeshita et al employ a comparator 10 to detect the presence of a shorted-to-ground fault. When this occurs, the comparator actuates a control circuit <u>to control the internal resistance</u> of the speech current supplying circuit, in order to increase the resistance between the ring-side resistor circuit 3 and the tip-side resistor circuit 4. As a result of this increase of resistance, current and power consumption can be decreased. The patentees go on to say that this functionality, per se, is not sufficient to ensure successful operation of the circuit. They describe that a problem can occur, if the current difference between the current in the ring and tip lines is reduced to a value less than a predetermined threshold value. If this occurs, the comparator 10 will no longer detect a shorted-to-ground fault, which will cause the control circuit to return the internal resistance of the speech current supplying circuit (which had been previously increased) to its original value. This can cause the circuit of Figure 1 to undesirably oscillate.

Takeshita et al describe that this oscillation problem is avoided by applying the output of the comparator 10 to a reference signal generator 11 after the comparator had detected a ground fault. This serves to decrease the threshold value and thereby prevent the undesirable oscillation phenomenon.

Nowhere do Takeshita et al describe the decoupling or isolation of anything, as inaccurately alleged by the Examiner. Increasing resistance to decrease current flow in a speech current supplying circuit is not the same as nor is it suggestive of, decoupling and isolating a respective one of a plurality of telecommunication wireline segments that carry span power from a span power source to a plurality of remote telecommunication terminals, as particularly characterized in step (e) of claim 21.

Lines 30-54 of column 2 and lines 44-52 of column 3 of patent to Takeshita et al, to which the Examiner makes reference in the statement of the Final Rejection, do not disclose or suggest the above enumerated steps of appealed claim 21. Rather, they are part of the description of the <u>internal resistance adjustment</u> mechanism of the speech current supplying circuit of Takeshita et al, which has absolutely nothing to do with the invention in appealed claim 21.

The Examiner alleges that the invention of Takeshita et al is "generally applicable to" any and all current supplying circuits disclosed by Appellants' admitted prior art and thus meets step (c) which is directed toward providing ground fault detection and isolation for each wireline segment. This suggestion on the part of the Examiner is an unsupported assertion.

In the first place, the ground fault detection-based control mechanism of Takeshita et al is for the specific purpose of <u>controlling the internal resistance</u> of a speech circuit current supply circuit. There is no disclosure in Takeshita et al of using the output of their comparator 10 to decouple and thereby isolate a respective powered telecommunication wireline segment, as the delineated in appealed claim 21. Takeshita et al's circuit is used for one purpose - to increase the internal resistance of the speech circuit's current supply circuitry. There is no suggestion in Takeshita et al to use the output of the comparator 10 to decouple and isolate a powered wireline segment from the other wireline segments of the system defined in appealed claim 21.

The Examiner next alleges that simply providing the ground fault circuits of Takeshita et al as taught will enable them to detect and isolate circuits as recited in step (d). Appellants respectfully submit that this statement is also inaccurate. Takeshita et al do <u>not</u> teach providing their ground fault circuits in respective wireline segments of a span-powered communication system for ground fault detection and isolation. Indeed, there is no disclosure anywhere in the prior art upon which the Examiner relies of providing such circuitry or using such circuits for the purpose claimed in claim 21. A major shortcoming of the Takeshita et al reference is the fact that it is not used, nor is there any suggestion that it be used, for decoupling and isolation of a ground-faulted powered wireline segment. In fact, it is not even used for decoupling and isolation of the very circuit in which it is employed. Rather, it is used <u>to increase the internal resistance of the current supplying circuit</u> of a speech circuit of a subscriber handset.

The Examiner's proposal, in the central paragraph of

page 3 of the Final Rejection, that lines 44-52 of column 3 of Takeshita et al disclose "isolation in response to ground fault detection" is also inaccurate. Lines 44-52 of Takeshita et al describe that the control circuit 7 of the circuit of Takeshita et al responds to the output of the comparator 10 indicating the presence of a ground fault to control the internal resistance of the speech current supplying circuit, in order to increase the resistance between the ring-side resistor circuit 3 and the tip-side resistor circuit 4. The term "isolation", or a term equivalent thereto, is not found anywhere in the Takeshita et al patent.

Appellants do not dispute that the specific circuit implementation employed by the present invention to detect a ground fault is similar to that employed by Takeshita et al to detect a ground fault. Namely, each detects current flowing in respective segments of the wireline and, based upon a difference in the detected measurements, generates an output representative of the occurrence of a ground fault. In Takeshita et al this is accomplished by the respective current detectors 8 and 9, which are respectively connected to the ring and tip lines and the outputs of which are coupled to the comparator 10, which compares the difference between these currents to a prescribed threshold, in order to determine whether a ground fault has occurred. In a like manner, the ground fault detector, per se, employed by Appellants, employs a differential amplifier to detect the difference between the voltages V01 and V02, which are respectively representative of the currents I1 and I2 flowing through the sense resistors R1sense and R2sense.

However, the claims on appeal are not directed to the circuit implementation of a ground fault detector, per se. Rather, the claims on appeal are directed to a methodology and

system for supplying span power by way of a plurality of wireline segments to respective remote terminals of the system, wherein each wireline segment incorporates a ground fault detection and isolation circuit that monitors its respective wireline segment for the occurrence of a ground fault and, upon detecting the same, decouples and isolates that wireline segment form the remainder of the system, in order to prevent misoperation of the remainder of the system.

Neither this methodology, nor a system employing such methodology is disclosed or suggested by either the admitted prior art or the patent to Takeshita et al. Moreover, as noted above, Takeshita et al neither disclose nor suggest using their ground fault detection circuit for anything other than controlling the internal resistance of a speech circuit's current supply circuit within a subscriber handset.

In the bottom paragraph on page 3 of the statement of the final rejection, the Examiner relies upon <u>Appellants' discussion of the problem</u> in a span-powered multiple transceiver unit architecture to support his conclusion that the claims on appeal are obvious. In the first place, as noted above, paragraph [03] of the present specification constitutes <u>Appellants' description of a problem, not an admission by Appellants</u> that it has been recognized by anyone else that the occurrence of a ground fault on one wireline segment will result in transceiver malfunction on all of its twisted pair telephone lines. Secondly, nowhere in any prior art of record is there a disclosure or a suggestion of monitoring each powered wireline segment for the occurrence of a ground fault, and isolating the span in which a ground fault has been detected from the other non-faulted powered wireline segments as claimed.

In view of the failure of both the admitted prior art and the cited patent to Takeshita et al to address the problem solved by Appellants' claimed invention, and to disclose or suggest a solution to that problem, by the installation of a respective ground fault detection and isolation circuit in each of a plurality of span-powered wireline segments and, upon detecting a respective ground fault, to decouple and isolate the wireline segment in which the ground fault has been detected to occur, as delineated in claim 21 (and likewise in claims 15 and 27), reversal of the rejection of claims 15-18, 21-24 and 27-29 is respectfully requested.

CONCLUSION

For the reasons advanced under the above heading "Arguments", Appellants respectfully submit that the invention defined in rejected claims 15-18, 21-24 and 27-29 is not rendered obvious by the admitted prior art and the cited patent to Takeshita et al, in the sense of 35 U.S.C. § 103, and respectfully request that the rejection thereof be reversed.

37 C.F.R. § 41.37 (c)(1)(vii) *Claims Appendix*

15. A method of delivering span power by way of a plurality of telecommunication wireline segments to respective ones of a plurality of remote telecommunication terminals, said method comprising the steps of:

(a) coupling said plurality of telecommunication wireline segments to a span power bus, so that span power is coupled from said span power bus to said plurality of telecommunication wireline segments;

(b) coupling respective ones of said plurality of telecommunication wireline segments to respective ones of said plurality of remote telecommunication terminals, so that said span power is delivered by said plurality of telecommunication wireline segments to said respective ones of said plurality of remote telecommunication terminals;

(c) coupling respective ones of said plurality of telecommunication wireline segments to respective ones of a plurality of ground fault detection and isolation circuits, a respective ground fault being capable of causing electrical current in excess of normal load current to flow in a remote telecommunication terminal that is connected to the respective telecommunication wireline segment in which the ground fault has occurred, and causing a reduction in said span power to a level that prevents proper operation of a remote telecommunication terminal that is coupled to a telecommunication wireline segment in which no ground fault has occurred;

(d) causing said ground fault detection and isolation circuits to monitor said plurality of telecommunication wireline segments for the occurrence of a ground fault therein; and

(e) in response to a ground fault detection and isolation circuit detecting, in step (d), the occurrence of a ground fault in an associated telecommunication wireline segment

to which said ground fault detection and isolation circuit is coupled, causing said ground fault detection and isolation circuit to decouple and isolate said associated telecommunication wireline segment from said span power bus, so as to prevent said reduction in said span power being delivered by others of said plurality of telecommunication wireline segments, in which no ground fault has been detected as having occurred, to remote telecommunication terminals coupled thereto, thereby preventing misoperation of said remote telecommunication terminals coupled to said others of said plurality of telecommunication wireline segments, wherein

step (d) comprises the steps of:

(d1) at said ground fault detection and isolation circuit, measuring a first parameter representative of current flowing in a first segment portion of said associated telecommunication wireline segment to said remote telecommunication terminal, and measuring a second parameter representative of current flowing in a second segment portion of said associated telecommunication wireline segment from said remote telecommunication terminal, and

(d2) at said ground fault detection and isolation circuit, in response a difference in said first and second parameters, providing an output representative of the occurrence of a ground fault in said associated telecommunication wireline segment, and wherein

step (e) comprises causing said ground fault detection and isolation circuit to decouple, and thereby isolate, said associated telecommunication wireline segment from said span power bus, in response to step (d1) providing said output representative of the occurrence of a ground fault in said associated telecommunication wireline segment.

16. The method according to claim 15, wherein step (d1)

comprises coupling a first sense resistor in said first segment portion of said associated telecommunication wireline segment and generating a first output voltage representative of current flowing in said first sense resistor, and coupling a second sense resistor in said second segment portion of said associated telecommunication wireline segment and generating a second output voltage representative of current flowing in said second sense resistor, and step (d2) comprises detecting a difference between said first and second output voltages, and generating said output representative of a ground fault in said associated telecommunication wireline segment, in response to a prescribed difference between said first and second output voltages.

17. The method according to claim 16, wherein step (d1) comprises coupling said first sense resistor to a current mirror that is operative to generate an output current in accordance with current flowing through said first sense resistor, and coupling said current mirror to a differential amplifier, which generates an output for controlling current through a controlled current device coupled in circuit with said current mirror and an output resistor across which said first output voltage is produced.

18. The method according to claim 17, wherein step (d1) further comprises coupling a voltage across said second sense resistor to a differential amplifier, which produces said second output voltage, and step (d2) comprises differentially combining said first and second output voltages to provide said output representative of a ground fault in said associated telecommunication wireline segment.

21. A method of delivering power, applied from an electrical power source to a span power bus, by way of a

plurality of telecommunication wireline segments to respective ones of a plurality of remote telecommunication terminals, said method comprising the steps of:

(a) coupling first portions of said plurality of telecommunication wireline segments to said span power bus, so that power is coupled from said span power bus to said first portions of said plurality of telecommunication wireline segments;

(b) coupling second portions of said plurality of telecommunication wireline segments to said respective ones of said plurality of remote telecommunication terminals, so that power coupled from said span power bus to said first portions of said plurality of telecommunication wireline segments is delivered by said second portions of said plurality of telecommunication wireline segments to said respective ones of said plurality of remote telecommunication terminals;

(c) coupling the first and second portions of respective ones of said plurality of telecommunication wireline segments to respective ones of a plurality of ground fault detection and isolation circuits;

(d) causing each ground fault detection and isolation circuit to monitor the respective telecommunication wireline segment to which said each ground fault detection and isolation circuit is coupled for the occurrence of a ground fault; and

(e) in response to a respective ground fault detection and isolation circuit detecting the occurrence of a ground fault on said respective telecommunication wireline segment in step (d), causing said respective ground fault detection and isolation circuit to perform the operation of decoupling, and thereby isolating, said respective telecommunication wireline segment from said span power bus, said operation being effective to prevent a change in the power being delivered by others of said plurality of telecommunication wireline segments to remote

telecommunication terminals coupled thereto, and thereby prevent misoperation of said remote telecommunication terminals coupled to said others of said plurality of telecommunication wireline segments, wherein

step (d) comprises the steps of:

(d1) at said each ground fault detection and isolation circuit, measuring a first parameter representative of current flowing in a first segment portion of said respective telecommunication wireline segment to said remote telecommunication terminal, and measuring a second parameter representative of current flowing in a second segment portion of said respective telecommunication wireline segment from said remote telecommunication terminal, and

(d2) at said each ground fault detection and isolation circuit, in response a difference in said first and second parameters, providing an output representative of the occurrence of a ground fault in said respective telecommunication wireline segment, and wherein

step (e) comprises causing said respective ground fault detection and isolation circuit to decouple, and thereby isolate, said respective telecommunication wireline segment from said span power bus, in response to step (d1) providing said output representative of the occurrence of a ground fault in said respective telecommunication wireline segment.

22. The method according to claim 21, wherein step (d1) comprises coupling a first sense resistor in said first segment portion of said respective telecommunication wireline segment and generating a first output voltage representative of current flowing in said first sense resistor, and coupling a second sense resistor in said second segment portion of said respective telecommunication wireline segment and generating a second output voltage representative of current flowing in said second sense

resistor, and step (d2) comprises detecting a difference between said first and second output voltages, and generating said output representative of a ground fault in said respective telecommunication wireline segment, in response to a prescribed difference between said first and second output voltages.

23. The method according to claim 22, wherein step (d1) comprises coupling said first sense resistor to a current mirror that is operative to generate an output current in accordance with current flowing through said first sense resistor, and coupling said current mirror to a differential amplifier, which generates an output for controlling current through a controlled current device coupled in circuit with said current mirror and an output resistor across which said first output voltage is produced.

24. The method according to claim 23, wherein step (d1) further comprises coupling a voltage across said second sense resistor to a differential amplifier, which produces said second output voltage, and step (d2) comprises differentially combining said first and second output voltages to provide said output representative of a ground fault in said respective telecommunication wireline segment.

27. A system for controlling delivery of span power supplied by a span power bus to respective ones of a plurality of remote telecommunication terminals, said system comprising:

a plurality of telecommunication wireline segments coupled to said span power bus, so that span power is coupled from said span power bus to said plurality of telecommunication wireline segments, respective ones of said plurality of telecommunication wireline segments being coupled to respective ones of said plurality of remote telecommunication terminals, so

that said span power is delivered by said plurality of telecommunication wireline segments to said respective ones of said plurality of remote telecommunication terminals; and

a plurality of ground fault detection and isolation circuits, coupled with respective ones of said plurality of telecommunication wireline segments between said span power bus and said plurality of remote telecommunication terminals, and being operative to monitor respective ones of said plurality of telecommunication wireline segments for the occurrence of a ground fault therein, a ground fault being capable of presenting a hazardous voltage condition to service personnel, causing electrical current in excess of normal load current to flow in a remote telecommunication terminal that is connected to the respective telecommunication wireline segment in which the ground fault has occurred, as well as producing a reduction of normal span power supplied by said span power bus and said telecommunication wireline segments, causing remote telecommunication terminals to malfunction; and wherein

a respective ground fault detection and isolation circuit is operative, in response to detecting the occurrence of a ground fault in an associated telecommunication wireline segment to which said respective ground fault detection and isolation circuit is coupled, to decouple and isolate said associated telecommunication wireline segment from said span power bus, so as to prevent said reduction in said span power being delivered by others of said plurality of telecommunication wireline segments, in which no ground fault has been detected as having occurred, to remote telecommunication terminals coupled thereto, thereby preventing misoperation of said remote telecommunication terminals coupled to said others of said plurality of telecommunication wireline segments, wherein

said respective ground fault detection and isolation circuit is operative to detect the occurrence of a ground fault in said

associated telecommunication wireline segment and to decouple and isolate said associated telecommunication wireline segment from said span power bus by:

i- measuring a first parameter representative of current flowing in a first segment portion of said associated telecommunication wireline segment to said remote telecommunication terminal,

ii- measuring a second parameter representative of current flowing in a second segment portion of said associated telecommunication wireline segment from said remote telecommunication terminal, and

iii- in response to detecting a difference in said first and second parameters - indicating the occurrence of a ground fault - decoupling, and thereby isolating, said associated telecommunication wireline segment from said span power bus.

28. The system according to claim 27, wherein said respective ground fault detection and isolation circuit is operative to perform step i by coupling a first sense resistor in said first segment portion of said associated telecommunication wireline segment and generating a first output voltage representative of current flowing in said first sense resistor, is operative to perform step ii by coupling a second sense resistor in said second segment portion of said associated telecommunication wireline segment and generating a second output voltage representative of current flowing in said second sense resistor, and is operative to perform step iii by detecting a prescribed difference between said first and second output voltages - indicating the occurrence of a ground fault - and decoupling, and thereby isolating, said associated telecommunication wireline segment from said span power bus.

29. The system according to claim 28, wherein said

respective ground fault detection and isolation circuit is operative to perform step i by coupling said first sense resistor to a current mirror that is operative to generate an output current in accordance with current flowing through said first sense resistor, and coupling said current mirror to a differential amplifier, which generates an output for controlling current through a controlled current device coupled in circuit with said current mirror and an output resistor across which said first output voltage is produced, and coupling a voltage across said second sense resistor to a differential amplifier, which produces said second output voltage, is operative to perform step ii by differentially combining said first and second output voltages, and is operative to perform step iii by detecting a prescribed difference between said first and second output voltages - indicating the occurrence of a ground fault - and decoupling, and thereby isolating, said associated telecommunication wireline segment from said span power bus.

<u>37 C.F.R. § 41.37 (c)(1)(ix) *Evidence Appendix*</u>

No evidence appendix is submitted herewith.

In Re Patent Application of:
SMITH ET AL
Serial No: **10/760,996**
Filing Date: **01/20/2004**

37 C.F.R. § 41.37 (c)(1)(x) *Related Proceedings Appendix*

There are no related proceedings.

Respectfully submitted,

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